IN THE CLAIMS

1. (Original) A torque sensor for determining the torque acting upon a shaft, the torque sensor comprising:

a radiation source emitting radiation of at least one wavelength;

at least one sensor sensing the emitted radiation generating thereby at least one intensity signal indicative of the intensity of the emitted radiation;

at least one signal conditioner receptive of the emitted radiation and positioned on a shaft between the radiation source and the at least one sensor thereby conditioning the emitted radiation; and

a circuit receptive of the at least one intensity signal determining thereby the torque acting upon the shaft and compensating for the attenuation of the emitted radiation.

2. (Original) The torque sensor as set forth in Claim 1 wherein the radiation source comprises a plurality of parallel light emitting diodes having alternate anodes connected either to electrical ground or energized by a prescribed voltage and alternate cathodes connected either to electrical ground or energized by the prescribed voltage.

3. (Original) The torque sensor as set forth in Claim 1 wherein the at least one signal conditioner comprises a plurality of polarizers having polarization axes oriented at a prescribed angle with respect to one another.

4. (Original) The torque sensor as set forth in Claim 3 wherein the plurality of polarizers are substantially opaque to radiation at the first wavelength and substantially transparent to radiation at the second wavelength.

5. (Original) The torque sensor as set forth in Claim 4 wherein the plurality of polarizers comprise thin film polarizers.

6. (Original) The torque sensor as set forth in Claim 5 wherein the thin film polarizers comprise dyes of long chain polymers.

7. (Original) The torque sensor as set forth in Claim 1 wherein the at least one sensor comprises a photodiode.

8. (Original) The torque sensor as set forth in Claim 3 wherein the circuit comprises:

a clock generating a timing signal;

at least one switch receptive of the timing signal and connected to the at least one sensor selecting either a first set of intensity signals indicative of the intensity of polarized radiation sensed at the first wavelength or a second set of intensity signals indicative of the intensity of non-polarized radiation sensed at the second wavelength;

a comparator comparing either a first intensity signal indicative of the intensity of the radiation sensed at the first wavelength to a reference signal to generate a first error signal or a second intensity signal indicative of indicative of the radiation sensed at the second wavelength to the reference signal to generate a second error signal; and

a drive circuit receptive of the timing signal and the first and second error signals generating thereby a drive signal to control the emission of radiation from the radiation source.

9. (Original) The torque sensor as set forth in Claim 8 further comprising:

a summing device receptive of a third intensity signal indicative of the intensity of the radiation sensed at the first wavelength and a fourth intensity signal indicative of the intensity of the radiation sensed at the second wavelength thereby determining the difference thereof and generating a compensated signal indicative of the attenuation of the radiation received by the polarizers due to a change in the angle between the axes of polarization;

a scaling device receptive of the fourth intensity signal, the compensated signal and the reference signal generating thereby a scaled compensated signal.

10. (Original) The torque sensor as set forth in Claim 8 further comprising:

a first amplifier amplifying the radiation sensed at the first sensor; and

a second amplifier amplifying the radiation sensed at the second sensor.

11. (Original) The torque sensor as set forth in Claim 8 further comprising:

a first amplifier connected to the at least one switch for processing a signal indicative of the intensity of the light received at the first sensor at the first wavelength and providing as output a signal indicative of the intensity of the polarized visible light captured by the first sensor;

a second amplifier connected to the at least one switch for processing a signal indicative of the intensity of the light received at the first sensor at the second wavelength and providing as output a signal indicative of the intensity of the non-polarized infrared light captured by the first sensor;

a third amplifier connected to the at least one switch for processing a signal indicative of the intensity of the light received at the second sensor at the first wavelength and providing as output a signal indicative of the intensity of the polarized visible light captured by the second sensor; and

a fourth amplifier connected to the at least one switch for processing a signal indicative of the intensity of the light received a the second sensor at the second wavelength and providing as output a signal indicative of the intensity of the non-polarized infrared light captured by the second sensor.

12. (Original) The torque sensor as set forth in Claim 8 wherein the reference signal comprises a bandgap reference voltage.

13. (Original) The torque sensor as set forth in Claim 8 wherein the plurality of switches are synchronously receptive of the timing signal.

14. (Original) The torque sensor as set forth in Claim 13 wherein the drive signal is in phase with the timing signal.

15. (Original) The torque sensor as set forth in Claim 14 wherein the drive signal is a bipolar signal.

16. (Original) The torque sensor as set forth in Claim 14 wherein the timing signal is a binary signal.

17. (Currently amended) The torque sensor as set forth in Claim 8 wherein the at least one switch comprises:

a first switch receptive of the timing signal and connected to a first sensor of the at least one sensor to alternately generate either a first intensity signal indicative of the intensity of polarized radiation at the first wavelength captured by the first sensor or a second intensity signal indicative of the intensity of non-polarized radiation at the second wavelength captured by the first sensor; and

a second switch synchronously receptive of the timing signal with the first switch and connected to a second sensor of the at least one sensor to alternately generate either a third intensity signal indicative of the intensity of polarized radiation at the first wavelength captured by the second sensor or a fourth intensity signal indicative of the intensity of non-polarized radiation at the second wavelength captured by the second sensor.

18. (Original) The torque sensor as set forth in Claim 2 wherein the plurality of light emitting diodes comprise:

a first light emitting diode having an anode connected to electrical ground and a cathode connected to a prescribed voltage, the first light emitting diode thereby emitting radiation at a first wavelength of the at least one wavelength; and

a second light emitting diode having a cathode connected to electrical ground and an anode connected to the prescribed voltage, the second light emitting diode thereby emit radiation at a second wavelength of the at least one wavelength.

19. (Original) The torque sensor as set forth in Claim 1 wherein the circuit is receptive of the at least one intensity signal thereby determining the torque acting upon the shaft.

20. (Original) The torque sensor as set forth in Claim 1 wherein the circuit is receptive of the at least one intensity signal thereby controlling the wavelength of the emitted radiation.

21. (Currently amended) A method of compensating for signal attenuation in a sensor sensing the torque acting upon a shaft, the method comprising:

generating radiation of at least one wavelength;

conditioning the radiation;

sensing the radiation;

responsive to the sensed radiation, generating at least one intensity signal indicative of the intensity of the radiation;

determining the intensity of the radiation due to a combination of the torque acting upon the shaft and the contamination of the sensor;

determining the intensity of the radiation due to the contamination of the sensor only; and

calculating the difference between the intensity of the radiation due to a combination of the torque acting upon the shaft and the contamination of the sensor and the intensity of the radiation due to the contamination of the sensor only to generate a compensated signal indicative only of the torque acting upon the shaft.

22. (Original) The method as set forth in Claim 21 wherein generating radiation of at least one wavelength comprises generating radiation at a first wavelength and at a second wavelength.

23. (Original) The method as set forth in Claim 21 wherein conditioning the radiation comprises directing the radiation through at least one polarizer.

24. (Original) The method as set forth in Claim 22 further comprising selecting a first intensity signal indicative of the intensity of the radiation sensed at the first wavelength and a second intensity signal indicative of the intensity of the radiation sensed at the first wavelength while generating radiation at the first wavelength or selecting a third intensity signal indicative of the intensity of the radiation sensed at the second wavelength and a fourth intensity signal indicative of the intensity of the radiation sensed at the second wavelength while generating radiation at the second wavelength.

25. (Original) The method as set forth in Claim 21 further comprising scaling the compensated signal by a gain factor equal to the ratio of the value of a reference signal to the value of the fourth intensity signal.

26. (Original) The method as set forth in Claim 24 further comprising comparing a reference signal with the first intensity signal generating thereby a first error signal or with the third intensity signal generating thereby a second error signal.

27. (Original) The method as set forth in Claim 26 further comprising responsive to the first and second error signals generating a drive signal to adjust the intensity of the generated radiation.

28. (Original) The method as set forth in Claim 22 wherein generating radiation at a first wavelength and at a second wavelength comprises alternately generating radiation at the first wavelength and at the second wavelength.

29. (Original) The method as set forth in Claim 29 wherein alternately generating radiation at the first wavelength and at the second wavelength comprises alternately generating radiation having a wavelength in the visible spectrum and radiation having a wavelength in the infrared spectrum.

30. (Original) The torque sensor as set forth in Claim 1 wherein the circuit comprises an integrated circuit.

31. (Original) The torque sensor as set forth in Claim 1 further comprising a cover encasing the radiation source, the at least one sensor, the at least one signal conditioner and the circuit.

32. (Original) The torque sensor as set forth in Claim 11 wherein processing a signal comprises at least amplifying or rectifying or filtering the signal or amplifying, rectifying and filtering the signal.